SEFSC Supplemental Socioeconomic Analysis

The following table estimates the total area, reported in nautical square miles (n. sq. mi.), of proposed SMZs by SEFSC Coastal Logbook Program statistical reporting grids. SMZs are assumed circular with radii reported in **Tables D-1** and **E-1**. Grid numbers follow lines of latitude and longitude. The first two digits in the four digit grid numbers are latitude degrees, and the second two digits are longitude degrees. The maximum area of a reporting grid in the South Atlantic EEZ is 3,600 n. sq. mi. while grids closer to shore will cover less space due to truncation of the water area by coastline. **Table 1** reports an upper bound estimate of the amount of commercial fishing activity in the proposed SMZs. To estimate the proportion of possible commercial fishing activity in the SMZs, we divide the total area of the SMZs by the maximum amount of one statistical grid (3,600 n. sq. mi.). Note that the proportion of fishing calculated in this manner is an overestimate since we are not using the total area of all statistical reporting grids listed in **Table 1**.

Table 1. Area (n. sq. mi.) of SMZs by SEFSC Coastal Logbook Statistical Reporting Area.

Statistical Reporting Grid	Nautical Square Miles	Proportion of Commercial Fishing in SMZs (Upper Bound)	Estimated Maximum Annual Loss of SG Revenues (Upper Bound)
North Carolina			
3675	0.25		
3575	2.00		
3475	0.50		
3476	2.50		
3477	1.50		
3377	0.75		
3378	1.50		
Total - NC	9.00	0.0025%	$9,225
South Carolina			
3378	0.37		
3279	0.08		
Total - SC	0.45	0.0001%	$472

Source: SEFSC Coastal Logbook.

Table 3.3.1.6 estimates average annual dockside revenue generated by snapper grouper landings in North Carolina from 2014-2018 of $3.69 million while **Table 3.3.1.8** estimates average annual dockside revenue generated by snapper grouper landings in South Carolina from 2014-2018 of $3.78 million. In **Table 1**, we multiply annual estimated revenues by our estimated upper bound of the proportion of fishing activity for each state. The result is an estimate of the maximum annual loss in the immediate term (i.e. one year) to the commercial sector if all commercial fishing activity was prohibited in the SMZs. Since commercial activity using handheld gear is still allowed in the SMZs, these loss figures are clearly overestimates of the possible negative impact in terms of lost dockside revenue to the commercial sector. On the other

hand, the lower bound of revenue loss would be zero if commercial fishing activity was not affected. Due to unavailability of site-specific landings data, this rough boundary of negative economic impact to the commercial fishing sector is our best estimate of immediate-term revenue losses. Gears, which offer "extraordinary advantages" to handheld gear, will not be allowed to be deployed in the SMZs. We are unable to estimate potential commercial revenue losses due to the exclusion of these gears since site-specific commercial landings by gear type in the SMZs does not exist at the necessary spatial resolution to conduct such an analysis. However, any lost dockside revenues associated with these gears would fall within the estimated maximum immediate-term loss of revenue reported in **Table 1**. Likewise, we are unable to estimate lost revenues due to limiting commercial catch to recreational bag limits; however, any losses associated to reduced commercial catches in this manner would also fall within the upper bound of estimated immediate-term losses in **Table 1**.

Given the lack of suitable data to conduct a proper quantitative analysis, it may be helpful to review qualitative and semi-quantitative explanations of the possible socioeconomic consequences that may develop after implementation of relatively small management areas similar to the SMZs proposed in Regulatory Amendment 34 (RA34). Perruso et al (2015) implemented a semi-quantitative impact assessment based on Delphi methodology to evaluate the net socioeconomic impact of alternative MPA sites proposed for the deep-water component of the snapper-grouper fishery (Amendment 14). Similar to the SMZs in RA34 the deep-water MPAs are relatively small, and site-specific landings and effort data were not available to conduct a quantitative analysis of socioeconomic regulatory impacts. Perruso et al (2015) conducted a complex experiment with experts who had explicit knowledge of ecological and economic impacts associated with MPAs in general and the deep-waters sites specifically. Although recreating a Delphi experiment for the RA34 SMZs was not feasible, a review of the conclusions from the A14 experiment may offer some insight to the socioeconomic impacts associated with the currently proposed SMZs. Furthermore, limited expert information is available from the North Carolina Division of Marine Fisheries and the South Carolina Department of Natural Resources in the Monitoring Team Report (**Appendix F**) in addition to public hearing commentary that can be used to compare the conclusions in Perruso et al (2015) to the current regulatory analysis.

Table 2 lists possible effects that could result in socioeconomic impacts to fishery stakeholders potentially affected by implementation of the RA34 SMZs. Although the list was originally created with the A14 deep-water MPAs in mind, the potential effects from implementation of the RA34 SMZs are expected to be similar. Perruso et al (2015) used an ordinal methodology to calculate ranks and relative weights of the four groupings of socioeconomic effects in **Table 2**. The results shown in **Table 3** are specific to the deep-water MPAs but offer insight into the dynamics of the realization of socioeconomic impacts on different stakeholder groups over time when SMZs such as those proposed in RA34 are implemented.

Table 2. Groupings of potential effects associated with the implementation of RA34 SMZs.

Groupings of Effects	**Administrative**	**Commercial, For-Hire, and Recreational**	**Community and Social Effects**	**Ancillary (Ecosystem) Effects**
Common Charac-teristics of the Group	**Management and Administration of SMZs**	**Influence of SMZs on Fishermen Fishing Inside or Outside SMZ**	**Community or Regional Influences**	**Influences Associated with Future Use or Status of the Resource**
	Conservation and Fishery Management Goals	Catch Levels and Landings Variation	Local Economic and Social Effects	Ecosystem and Habitat Effects
	Enforcement and Monitoring	Trip-Level Search and Other Costs	Regional Economic and Social Effects	Option and Existence Values
	Education and Awareness	Crowding and Congestion	Associated Employment (e.g. fish houses, dealers, bait and tackle shops)	Bycatch Mortality
	Improved Stock Assessments	Personal Safety		Non-consumptive (non-use) Opportunities
	Insurance Against Stock Collapse	Commercial and For-Hire Profitability and Recreational Enjoyment		Replenishment, Abundance, and Other Stock Effects
	Improved Knowledge of Marine Systems and Effectiveness of SMZs	Replenishment, Abundance, and Other Stock Effects		Catch Levels and Landings Variation
	Ecosystem and Habitat Effects	Industry Employment		

Table 3. Ranks and Relative Weights of Four Groupings of Effects Associated with the Implementation of Type II Deep Water MPAs (Perruso et al, 2015),

Group Heading	Immediate		Medium-Run		Long-Run	
	Rank	**Weight**	**Rank**	**Weight**	**Rank**	**Weight**
Administrative	2	0.95	1	1.00	2	0.84
Commercial, For-Hire, and Recreational	1	1.00	2	0.89	3	0.81
Ancillary (Ecosystem) Effects	3	0.71	2	0.89	1	1.00
Community and Social Effects	4	0.60	4	0.64	4	0.59

In **Table 3**, weighting implies that some groups of effects should be more influential than others on the final determination of socioeconomic impacts after implementation of the SMZs. For instance, **Table 3** suggests that within one year of implementing a network of SMZs community and social effects would be 60% as important as effects on the commercial, recreational, and for-hire sectors in determining the overall impact of the different proposed sites for each SMZ. The effects ranked as most important in each time period have weights of 1.00.

Some interesting trends are depicted in **Table 3**. First, community and social effects may be less important than all other groupings in all time periods when analyzing socioeconomic effects resulting from the implementation of SMZs. In the immediate-term, some negative yet minimal effects could affect commercial fishermen, fish houses or core labor patterns, and negative attitudes toward the SMZs by the local fishing communities may surface due to initial dissatisfaction with the program. These negative impacts should dissipate over time as fishermen and fish houses adjust to the minimally sized closed areas, and communities become indifferent to the SMZs after the initial displacement effects are absorbed. Enforcement is a key component as to whether future community benefits would be realized as cheating could erode local support just as long-term ecological benefits start to materialize.

Second, **Table 3** shows that as time goes on the importance of effects on commercial, for-hire, and recreational fishermen may become less of a factor in determining the difference in socioeconomic consequences due to the SMZs. Initially, some commercial fishermen may have to avoid traditional fishing areas and incur displacement costs. As fishermen make adjustments to the new regulations and fish around the closed areas or switch to handheld gear within the SMZs, the negative impacts dissipate over the medium- and long-terms. The negative impact of

immediate displacement effects are likely to be minimal due to the small sizes of the proposed SMZs, allowance of handheld gears and the existence of viable alternative grounds close by. However, the immediate-term impacts to the commercial fleet could be significantly higher for SMZs that encompass mid-shelf waters. Spillover and recruitment effects would create socioeconomic benefits for the fishing sectors related to stock enhancement (e.g., abundance, replenishment, condition) in the long-term by improving yield per unit of effort; however, these benefits are likely to be minimal due to the size of the SMZs. Again, enforcement may be a key component as to whether long-term bioeconomic-related benefits will materialize.

Third, over time ancillary (ecosystem) effects become more important in assessing socioeconomic impacts resulting from the implementation of the SMZs. These effects may happen very slowly at first, and then accelerate in the medium- and long-terms. The SMZs are expected over time to produce biological benefits that are correlated with positive socioeconomic impacts. Potential positive bioeconomic-related impacts may be generated from long-term biological stock benefits (e.g., resource and ecosystem replenishment, stock condition and abundance), future spillover effects, increased ecosystem quality, and option and existence values. Immediate-term benefits may be realized from immediate protection provided to stocks, the ecosystem, and habitats as well as a reduction in bycatch mortality and overfishing related to the prohibition of non-handheld gears. Ancillary effects are likely to be a net positive in the medium- and long-terms, and either neutral or positive in the immediate-term.

Lastly, administrative effects should be viewed as relatively important throughout all time periods. Over time enforcement will be a very important determinant of socioeconomic consequences especially if the quality and quantity of the resources in the SMZs change for the better. Other important administrative impacts include increased managerial flexibility relative to the use of traditional regulations, improved stock assessments, and the burden of educating stakeholders.

Sources Cited:

Perruso, Larry, Jeffrey C. Johnson, Paul Baertlein and Denise H. Johnson. 2015. A Socioeconomic Valuation of a Network of Deepwater Marine Protected Areas. *Marine Fisheries Review*, 77(3): 73-83.